BRIEF OUTLINE OF COURSES B.SC.AG.

(Approved as of 2076/11/08 Academic Council TU)

Semester	Course code	Course Title
First	ABE111 (2+1)	General Biochemistry
	AEC111 (2+0)	Principles of Economics
	AGR111 (2+1)	Principles of Agronomy
	HRT111 (2+1)	Introductory Horticulture
	SSC111 (2+1)	Fundamentals of Soil Science
	LPM111 (2+1)	Introductory Animal Science
	PLB111 (2+1)	Principles of Genetics
	EXT 111 (2+1)	Fundamentals of Rural Sociology and Educational Psychology

Course Code : **ABE 111**
Course Title : **General Biochemistry**
Credit Hour : **3 (2+1)** **Full mark: 75** **Theory: 50** **Practical: 25**

OBJECTIVES

Upon the completion of this course, students will be able to understand the basics of biochemistry: the fundaments, how plant and living entity are composed and how they behave in a molecular level. They will be able to understand the composition, structure, functions and properties of biomolecules and correlate with plant science.

SYLLABUS

Introduction, history, scope, importance and practical application of biochemistry in agriculture. Membrane and transport system of plant cell. Transport across cell membrane, osmosis, diffusion, active and passive transports. Water and electrolyte, Donnan membrane equilibrium. Acid-base, biological buffer system. Structure, classification and functions of carbohydrates, proteins and lipids. Stereoisomerism of monosaccharides. Structural organization of protein, cholesterol, prostaglandins and bile salts. Structure and types of nucleic acids: DNA and RNA. Enzymes, kinetics and mechanism of action and enzyme inhibition. Glycolysis, TCA, HMP shunt, protein degradation, urea cycle, oxidative phosphorylation and some potent inhibitors of electron transport chain, rotenone, cyanide and carbonmonooxide.

COURSE OUTLINE

Theory

S.N.	Topic	No. of lecture
1	Introduction: Introduction, history, scope, importance and practical application of biochemistry in agriculture	1
2.	Membrane and transport system of plant cell	
	2.1 Composition of biological membranes, fluid-mosaic model	1
	2.2 Transport across cell membrane, osmosis, diffusion, active and passive transports	1
3.	Water, pH and buffer in biological system	
	3.1 Water and electrolytes; ionization of water, cations and anions, and Donnan membrane equilibrium	1
	3.2 Acid and base; Arrehenius, Bronsted- Lowry, Lewis concept, dissociation constant	1

	3.3 pH and pH homeostasis, biological buffers, and Henderson-Hasselbalch equation	1
4.	Biochemistry of carbohydrates	
	4.1 Definition, functions, occurrence and classification of carbohydrates on the basis of hydrolysis, reducing behavior and solubility	1
	4.2 Physical properties, stereoisomerism- functional group isomers, epimers, optical isomers, anomers, mutarotation, and chemical reactions: oxidation and reduction of monosaccharides	1
	4.3 Structure of ribose, glucose, fructose, galactose, mannose, aminosugars, maltose, iso- maltose, lactose, sucrose, starch, dextrins, glycogen, cellulose, inulin and chitin	1
5.	Biochemistry of proteins	
	5.1 Amino acids: definition, structure, properties-amphoteric nature, optical activity, and classification on the basis of their side chain, metabolic fate and nutritional value	1
	5.2 Protein: peptide bond, classification on the basis of functions, structure and composition	1
	5.3 Structural organization of protein, denaturation, misfolding and prion disease	1
6.	Biochemistry of lipids	
	6.1 Fatty acid: structure, function and classification, essential fatty acids and PUFA	1
	6.2 Structure and classification of lipids: simple, compound and derived lipids	1
	6.3 Structure and function of cholesterol, prostaglandins and bile acids	1
7.	Biochemistry of Nucleic acids	
	7.1 Nitrogenous bases; purines and pyrimidines, nucleoside and nucleotides with structure	1
	7.2 Structure, functions and types of DNA and RNA, Watson and Crick model of DNA, mRNA, tRNA, rRNA and hnRNA	1
	7.3 Organization of DNA, supercoiling, histone protein, nucleosome, chromatin and chromosomes	1
8.	Enzymes	
	8.1 Definition, nomenclature and classification, coenzymes, cofactors, activators, apo- enzyme and holoenzyme	1
	8.2 Mechanism of enzyme action, enzyme kinetics, Michaelis Menten equation-its significance and enzyme specificity	1
	8.3 Factors affecting enzyme activity (substrate, product, enzyme concentration, temperature, pH, activators and inhibitors)	1
9.	Carbohydrate metabolism	
	9.1 Biosynthesis of sucrose, starch and glycogen	1
	9.2Glycolysis: location, steps, significance, fate of pyruvate in aerobic and anaerobic conditions	1
	9.3 TCA: location, steps and significance, common metabolic pathway, amphibolic pathway	1
	9.4 Pentose phosphate pathway: location and significances	1
10.	Protein metabolism	
	10.1 Overview of protein degradation, ubiquitination-role of ubiquitin during protein degradation	1
	10.2 Transamination, deamination, trapping of ammonia and its detoxification, urea cycle	1
11.	Electron Transport Chain	

	11.1 Enzymes involved in oxidation- reduction, and electron carriers	1
	11.2 Oxidative phosphorylation, and chemiosmotic theory of ATP synthesis	1
	11.3 Shuttle system involved in ETC and potent inhibitors of ETC (Rotenone, Cyande, and hxCarbon monooxide)	1
	Total	**30**

Practical

S.N.	Topic	No. of practical
1	Introduction and use of laboratory equipments and glass wares	1
2	Preparation of standard solutions: normal, molar and percentage solutions	1
3	Titration curve of amino acid	1
3	Preparation of colloidal solutions	1
4	Preparation of buffer solutions and determination of pH	1
5	Identification of carbohydrate and qualitative estimation of reducing and non-reducing sugars	2
6	Qualitative estimation of protein	1
7	Qualitative estimation of lipids	1
8	Quantitative estimation of blood glucose by GOD POD method	1
9	Determination of iodine number in vegetable oils	1
10	Quantitative estimation of cholesterol.	1
11	Demonstration of spectrophotomer, gel electrophoresis, thin layer and paper chromatography	3
	Total	**15**

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Lehninger, A.L. 1975. Principle of Biochemistry. Kalyani Publishers, New Delhi, India.

Nelson, D.L. and M.M. Cox. 2000. Principles of Biochemistry. ISBN: 1572599316.

Plummer, D.T. 2004. An Introduction to Practical Biochemistry. Tata McGraw Hill, New Delhi.

Shakya, L., S. Khanal and S. Sapkota. 2017. Textbook of Biochemistry. Makalu Publication House, Kathmandu, Nepal.

Voet, D. and J.G. Voet. 2003. Biochemsitry. Wiley, John & Sons. (3rd ed.). ISBN: 047119350X.

Course Code : AEC 111
Course Title : Principles of Economics
Credit Hour : 2 (2+0) Full mark: 50 Theory: 50 Practical: 00

OBJECTIVES

Upon the completion of this course, the students will be able to understand the general concept and principles of economics, particularly related with production, consumption and distribution.

SYLLABUS

Definitions of economics: Adam Smith, Marshall and Robbins. Subject matter and nature of economics. Basic concept - goods, utility, value, wealth, equilibrium, consumption, production and margin. Ordinal and cardinal approach of utility measurement. Law of diminishing marginal utility. Indifference curves and their analysis. Price: income and substitution effects. Demand: concept, determinants, law and elasticity. Supply: concept, determinants, law and elasticity. Cost curves and their relationships. Market: concept and forms; characteristics and price determination of perfect competition, monopoly and monopolistic markets. Definition, characteristics and theories of land (rent), labour (wage), capital (interest) and organization (profit). Malthusian and optimum theories of population.

COURSE OUTLINE

Theory

S.N.	Topic	No. of lecture
1	Basic concepts on economics	
	Concept on goods, utility, value, price, wealth, production, consumption, equilibrium and margin	1
2	Concept, definition, nature and subject matter of economics	
2.1	Concept of economics, micro and macro economics, importance of economics	1
2.2	Definition by Adam Smith and Marshall	1
2.3	Definition by Robbins and comparisons between three definitions	1
2.4	Subject matter and nature of economics	1
3	Consumer behavior	
3.1	Concept and assumptions of ordinal and cardinal approach of utility measurement	1
3.2	Concept, assumptions, application and exceptions of law of diminishing marginal utility	1
3.3	Indifference curve and its properties	1
3.4	Price effect: income and substitution effects on normal, inferior and Giffen goods	1
4	Demand	
4.1	Demand concept and determinants of demand	1
4.2	Law of demand (concept, reasons and explanation) and change in demand	1
4.3	Elasticity of demand: concept, types and degrees	1
4.4	Measurement of elasticity of demand	1
5	Supply and cost	
5.1	Supply concept and determinants of supply	1
5.2	Law of supply and change in supply	1
5.3	Elasticity of supply and its measurement	1
5.4	Types of cost, cost curves and their relationships	1
6	Market	
6.1	Concept and types of market structures	1
6.2	Characteristics and price determination on perfect competition market	1
6.3	Characteristics and price determination on monopoly market	1
6.4	Characteristics and price determination on monopolistic market	1
7	Land and rent	
7.1	Definition and characteristics of land	1
7.2	Theories of rent: Ricardian and modern theory of rent	1
8	Labour and wage	
8.1	Definition and characteristics of labour	1
8.2	Theories of wages: modern and marginal productivity theory of wages	1
9	Capital and interest	
9.1	Definition, characteristics and types of capital, concept of interest	1
9.2	Theories of interest: liquidity preference and modern theory of interest	1
10	Organization and profit	
10.1	Concept and types of organization and profit	1
10.2	Theory of profit: Schumpeter theory of profit	1
11	Theories of population	
11.1	Malthusian and optimum theory of population	1

	Total	**30**

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Ahuja, H.L. 1987. Advanced Economic Theory - Microeconomics Analysis (15th ed.). S. Chand & Co., New Delhi.
Chopra, P.N. 2000. Principles of Economics. Kalyani Publishers, New Delhi.
Dewett, K.K. and J.D. Varma. 1986. Elementary Economics. S. Chand and Co., New Delhi.
Dewett, K.K. and A. Chand. 1979. Modern Economic Theory. S. Chand and Co., New Delhi.
Koutsoyiannis, A. 1979. Modern Microeconomics (2nd ed.). MacMillan Press Ltd, London.
McConnel, C.R. 1975. Economics, Principles, problems, and policies. McGraw-Hill, USA.

Course Code : **AGR 111**
Course Title : **Principles of Agronomy**
Credit Hour : **3 (2+1)** **Full Mark: 75** **Theory: 50** **Practical: 25**

OBJECTIVE

The main objective of this course is to provide students with basic concepts, knowledge and skills on the principles behind the practices of crop production.

SYLLABUS

Definition, concept and evolution of agriculture and agronomy, their relationship with other disciplines, food situation in Nepal and issues of food security, crops and their classification, crops and climate, tillage, seed, cropping systems and farming systems, cropping pattern and crop rotation, concept of ideal plant type and crop yield, optimum plant population, crop geometry and cropping density, soil fertility and productivity, agronomical practices for soil fertility and crop productivity maintenance, crop nutrition, fertilizers and manures, organic manures and bio-fertilizers, weed management, plant and soil water relationship, importance of irrigation and drainage systems, soil erosion and soil conservation, rainfed farming and water harvesting, recent advances in agronomy and issues of sustainability in agriculture.

COURSE OUTLINE

Theory

S.N.	Topic	No. of lecture
1.	Overview of agriculture and agronomy	
1.1	Definition of agriculture, multidisciplinary nature of agriculture, evolution of agricultural systems, crop and agronomy, green revolution, ecological agriculture, scope and role of agronomy and retrospect of Nepalese agriculture	1
1.2	Status of Nepalese farmers, farming practices in different agro-ecological zones and our journey in agriculture	1
1.3	Definition of food and food security, major problems of Nepalese agriculture, and role of agronomist in solving food problems in Nepal	1
1.4	Phyto-geography and agriculture heritage in Nepal	1
2	Weather and climate	
2.1	Definition of weather, climate, meteorology, agro-meteorology, major elements of climate, importance, need and scope of climate in Nepal	1
2.2	Agro-climatic zones of Nepal, effect of temperature on biochemical reaction, photosynthesis, respiration, growth and growth duration of crops and concept of growing degree days	1

2.3	Solar radiation, its photosynthetic, photoperiodic, thermal and other effects on crop growth, development and yield	1
2.4	Precipitation and its effect on crop production, land classification based on precipitation, relative humidity, wind and their effect on crop growth, development and yield	1
3	Tillage	
3.1	Definition of tillage, brief history and objectives of tillage, types of tillage, advantages and disadvantages of conventional and conservation tillage	1
3.2	Definition of primary, secondary and inter-tillage, important tools, equipments and machines used for tillage	1
4.	Seed and sowing	
4.1	Definition of seed, grain, seed technology, characteristics and importance of quality seed	1
4.2	Classes of seed, methods of sowing, factors involved in sowing management	1
5.	Cropping system	
5.1	Definition, cropping pattern, sole cropping, multiple cropping, intercropping, mixed cropping, relay cropping and crop rotation, cropping index, cropping intensity, and land equivalent ratio	1
5.2	Cropping systems by seasons in Nepal, characteristics of seasons, agronomic concepts of the growing seasons, effect of season on choice of crops, and efficient crop zone	1
6.	Plant type and plant population	
6.1	Concept of ideal crop, plant type and yield, cropping density, optimum plant population, crop geometry and their importance	1
7.	Soil fertility and productivity	
7.1	Definitions and differences, major soils of Nepal (alluvial soils, black soils and red soils) and problematic (saline and alkaline soils)	1
7.2	Elements in plant nutrition, classification of essential elements, forms of elements absorbed by plants (nutrients), soil productivity constraints, nutrient deficiency and toxicity	1
7.3	Organic manures and their importance, FYM, compost, vermicompost, night soil, sewage and sludge, biogas slurry, oil seed cakes and green manures	1
7.4	Chemical fertilizers and their role in crop production, nitrogenous, phosphatic and potassic fertilizers, and micronutrient supplements available in Nepal	1
7.5	Biofertilizers and their importance, types, factors affecting fertilizer use, limitation of organic manures, green manures and green leaf manures, bio-fertilizer and chemical fertilizers available in Nepal	1
8.	Weed management	
8.1	Definition of weed, classification, beneficial and harmful effects of weeds	1
8.2	Mode of weed seed dispersal, concept of weed management: preventive and curative (physical, chemical, biological and chemical) methods, relative merits and demerits of different methods	1
9.	Irrigation and drainage	
9.1	Definition of irrigation, importance of irrigation to crops, water movement in soil-plant–atmospheric system, and water use efficiency	1
9.2	Methods of irrigation: surface and subsurface methods (gravity irrigation, tank irrigation and lift irrigation) with their advantages and disadvantages	1
9.3	Irrigation scheduling, estimation of soil moisture constants, and irrigation management under limited water supply.	1
9.4	Drainage: definition and objectives of drainage, types of drainage, adverse effect of water logging, and method of improving soil drainage system.	1
10.	Soil erosion	

10.1	Definition of soil erosion, types of soil erosion based on erosive agents, water erosion and its types, factors affecting water erosion, water erosion in Nepal	1
10.2	Wind erosion and its types, factors affecting wind erosion, wind erosion in Nepal, and measures taken against water and wind erosion in Nepal	1
11	Rainfed farming and water harvesting technology	
11.1	Rainfed farming: difference between dry land farming and rainfed farming, importance of rainfed farming in Nepal, management of farming under moisture stress condition, water harvesting	1
11.2	Recent trends and advances in agronomy and issues of agricultural sustainability in Nepal	1
	Total	30

Practical

S.N.	**Topic**	**No. of practical**
1.	Visit to the Agronomy Farm and laboratories of the campus	1
2.	Identification of the seeds of field crops, fertilizers, manures and pesticides	1
3.	Introduction to the tillage implements and practice on their use	1
4.	Understanding seeding practices and working with seeding imlements	1
5.	Calculation of the amount of fertilizers based on recommended dose and nutrient content	1
6.	Calculation of cropping index, cropping intensity, land equivalent ratio (LER), and land use efficiency (LUE)	1
7.	Calculation of soil moisture constants, and water use/irrigation efficiency	1
8.	Practice on the preparation of FYM and compost by different methods	1
9.	Practices on vermicompost, green manures and bio-fertilizers and their applicability	1
10.	Identification of the major weeds of field crops and preparation of herbarium	1
11.	Identification and practice on the use of various agro-meteorological devices	1
12.	Maturity judgment and yield estimation of major field crops	1
13.	Formulation of pesticides and practices on their application	1
14.	Practice on seed treatment with different pesticides	1
15.	Introduction to national and international crop research and development organizations	1
	Total	**15**

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Acquaah, G.2005. Principles of Crop Production: Theory, Techniques, and Technology (2nd ed.), Pearson.

Nandeha, K. L. 2015. Agronomy. Today & Tomorrow's Printers and Publishers, New Delhi

Course Code : **HRT 111**
Course Title : **Introductory Horticulture**
Credit Hour : **3 (2+1)** **Full Mark: 75** **Theory: 50** **Practical: 25**

OBJECTIVES

This course provides students knowledge and skill about principles and practices of basic horticulture.

SYLLABUS

Definition, branches, classification and importance of horticultural crops; relation to other disciplines including value addition; ecological regions and niches in Nepal for different horticultural crops; feasibility of horticulture development in Nepal; climatic factors affecting crop production: light, temperature, heat budget, rain, and humidity; measures to overcome environmental stress; basic principles of orchard establishment. Principles and practices of plant propagation, training and pruning of fruit trees and vines; orchard management practices, manuring and fertilization, irrigation and drainage; inter-cropping, soil and water conservation practices; juvenility, flowering, pollination, fruit set and fruit growth, ripening and fruit drop, tuber and bulb formation; plant growth substances in horticulture; high density and multistoried planting, organic farming, off-season production and protected horticulture; peri-urban horticulture; horticultural genetic resources and indigenous horticultural plants.

COURSE OUTLINE

Theory

S.N.	Topic	No. of lecture
1.	Definition, branches and classification of horticultural crops	1
2.	Relation to other disciplines, and value addition of horticultural crops	1
3.	Importance of horticultural crops in Nepal	1
4.	Ecological regions and niches for different horticultural crops in Nepal	1
5.	Feasibility of horticulture development in Nepal	1
6.	Climatic factors affecting horticultural crop production: light, temperature and heat budget; rain, humidity, hailstone and wind	2
7.	Measures to overcome environmental stress	1
8.	Basic principles of orchard establishment: site selection, layout and planting; and types of horticultural enterprises	2
9.	Principles and practices of plant propagation	
	a. Sexual propagation and specialized structures	1
	b. Cutting and layering	1
	c. Grafting and budding	1
	d. Mist- and micro propagation	1
10.	Principles and practices of training and pruning: objectives, system of training, types of pruning and pruning of different fruit crops	2
11.	Orchard management practices: soil fertility management; irrigation and drainage; soil water conservation measures, and weed management	2
12.	Seed and bud dormancy	1
13.	Germination and juvenility	1
14.	Flowering and fruiting (fruit set, fruit growth, fruit drop, ripening, abscission and senescence)	1
15.	Tuber and bulb formation	1
16.	Plant growth substances	1
17.	Functions of plant growth substances	1
18.	Commercial uses of plant growth substances in horticultural crops	1
19.	Principles of off-season and protected horticulture	1
20.	Organic farming, needs and prospects	1
21.	Principles of high density and multi-storied cropping	1
22	Principles of peri-urban horticulture and soilless culture	1
23	Genetic resources and indigenous horticultural plants	1
	Total	**30**

Practical

S.N.	Topic	No. of practical
1.	Identification of horticultural tools and equipments	1
2.	Identification of fruits, vegetables and ornamental plants	1
3.	Identification of major horticultural crop growing areas and regions of Nepal	1
4.	Layout of orchard for different systems of planting fruit crops	1
5.	Preparation of contour line for planting trees across the sloping land	1
6.	Preparation of pit and planting of fruit saplings	1
7.	Training of fruit trees	1
8.	Pruning of fruit trees	1
9.	Propagation of horticultural crops by grafting	1
10.	Propagation of horticultural crops by budding	1
11.	Propagation of horticultural crops by layering	1
12.	Propagation of horticultural crops by cutting	1
13.	Preparation of different concentrations of PGR for horticultural uses	1
14.	Seasonal work experiences practices in horticultural crops	2
	Total:	**15**

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Shrestha, G. K., S. M. Shakya, D. R. Baral and D. M. Gautam. 2001. Fundamentals of Horticulture. Institute of Agriculture and Animal Science, Rampur, Chitwan, Nepal.

Course Code : **SSC 111**
Course Title : **Fundamentals of Soil Science**
Credit Hour : **3 (2+1)** **Full Mark: 75** **Theory: 50** **Practical: 25**

OBJECTIVES

In pursuing this course, the students will learn the basic knowledge of soil formation in relation to physical and chemical properties of soil along with their management options.

SYLLABUS

Definition, concept and use of soils; geology in relation to soils-evolution and composition of earth, development of soils; rocks and minerals-origin, classification, distribution and weathering; soil formation; important soil flora and fauna; soil as a medium for plant growth; soil components and soil-plant relationship; physical properties of soils: mechanical composition and textural classification, soil structure and its importance, soil color and its importance, bulk density, particle density and porosity of soils, consistence and plasticity; soil colloids: organic and inorganic colloids and their properties; cation and anion exchange phenomena; silicate clays: composition and properties; soil reaction: pH and measurements, soil acidity and alkalinity, effect of soil pH on nutrient availability, buffering of soils, amendments of acid, saline and sodic soils.

COURSE OUTLINE

Theory

S.N.	Topic	No. of lecture
1	Concept, definition, scope and branches of soil science	1
2	Historical development of soil science and soil institutions in Nepal	1
3	Evolution and composition of earth	1

4	Land system, land forms and land units	1
5	Weathering of rocks and minerals and soil forming rocks and minerals	2
6	Basic and pedogenic processes of soil formation	1
7	Factors affecting soil formation	1
8	Soil as a natural body; ecological functions of soil	1
9	Kinds and distribution of soil flora and fauna	1
10	Physical properties of soil	
	a. Soil components	1
	b. Soil texture and textural classification and its importance	1
	c. Soil structure: types, class and grades	1
	d. Formation of soil structure and importance of soil structure	1
	e. Bulk density, particle density and porosity; and their importance	1
	f. Soil color and its importance	1
	g. Soil consistency and its importance	1
11	Chemical properties of soil	
	a. Properties and types of soil colloids	1
	b. Fundamental structure of silicate clay and charge development of silicate clays	2
	c. Mineralogical organization of crystalline silicate clays	1
	d. Genesis of soil colloids	1
	e. Ion exchange, ion exchange capacity and its importance	2
	f. Concept of soil pH and properties of acid soils and buffering capacity of soils	2
	g. Different pools, causes and effects of soil acidity	1
	h. Influence of soil pH on nutrient availability and management of acid soils	1
	i. Properties of salt affected soils	1
	j. Effects and management of salt affected soils	1
	Total:	**30**

Practicals

S.N.	Topic	No. of practical
1	Precautions to be taken while working in soil science laboratory; Identification of equipments used in soil science laboratory	1
2	Identification of major soil forming rocks and minerals	1
3	Soil sampling and processing for laboratory analysis	1
4	Soil textures determination by feel method	2
5	Particle size analysis by hydrometer method	1
6	Determination of soil structure	1
7	Determination of soil bulk density	2
8	Determination of particle density and porosity	1
9	Determination of soil color	1
10	Determination of soil consistency	2
11	Determination of soil pH and electrical conductivity	1
12	Determination of cation exchange capacity of soil	1
	Total:	**15**

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Baruch, T.C. and H.P. Barthakur. 2001. A Textbook of Soil Analysis. Sangam Books Ltd.

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Khatri-Chetri., T.B. 1991. Introduction to Soils and Soil Fertility. Institute of Agriculture and Animal Science, TU Press.
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Sarkar, A.K.2014. Acid Soils: Their Chemistry and Management. New India Publ. Agency,India.
Tan, K.H. 2005. Soil Sampling, Preparation, and Analysis (2nd ed.). CRC, Press.

Course Code : LPM 111
Course Title : Introductory Animal Science
Credit Hour : 3 (2+1) Full Mark: 75 Theory: 50 Practical: 25

OBJECTIVES

The main objective of this course is to teach the students about importance of livestock and poultry industry; prevention and control measures of commonly occurring diseases and parasites of livestock and poultry.

SYLLABUS

Importance, scope hindrances of livestock and poultry in Nepal.Zoological classification of farm animals and birds, Differences between ruminant and non-ruminant.Commonly used terms of animal husbandry.Ageing, weighing, identifications,Animal restraining and handling.Marketing and transportation. Sign of health and diseases. Care and management of sick animals. Control and prevention of major diseases and parasites (H.S.,BQ., FMD, Brucellosis, Ranikhet, Fowl pox, Coccidiosis, Gumboro disease, Mareck's disease, Swine Fever, ticks, lice, Fleas, liver fluke, Ascariasis, tapeworm). Importance of barn sanitation and waste handling.Farm records.

COURSE OUTLINE

Theory

S.N.	Topic	No. of lecture
1.	Introduction and importance of livestock and poultry	1
2.	Scope and constraints of livestock and poultry production in Nepal	1
3.	Terminologies related to livestock and poultry production	1
4.	Zoological classification of farm animals and poultry	2
5.	Breed characteristics of important breeds of cattle (Jersey, Holstein Friesian, Brown Swiss, Achhami, Lulu, Yak/Nak, Chauri, Red Sindhi, Sahiwal and Hariana), buffalo (Murrah, Nili Ravi, Jafrabadi, Tarai, Lime and Parkote), sheep (Bhyanglung, Baruwal, Kage, Lampuchhre, Merino, Rambouillet and Polworth.) and goat (Jamunapari, Barbari, Black Bengal, Beetal, Boer, Saanen, Khari, Tarai, Sinhal and Chyangra)	2
.6.	Breed characteristics of important breeds of Pig (Chwache, Bampudke, Hurrah, Hampshire, Landrace, Duroc and Yorkshire) and poultry (Cobb 500, New Hampshire, Leghorn, Austrolop, Giriraj and Lohmann)	1
7.	Differences between ruminants and non-ruminants	1
8.	Animal restraining and handling	1
9.	Identification of farm animals	1
10.	Weighing and ageing of farm animals	1
11.	Marketing and transportation of farm animals including poultry and rabbits	2
12.	Sign of health and diseases in farm animals	2
13.	Care and management of sick animals	1
14.	Care and management of newborn calf, kid and lamb	1

	Care and management of newborn piglet	1
15.	Feeds, fodder and their classification	2
16.	Feeding of farm animals	1
17.	Importance of barn sanitation and waste handling	2
18.	Important farm records, their preparation and maintenance	2
19.	Prevention and control of major diseases of livestock and poultry (H.S., B.Q., FMD, Brucellosis, Ranikhet, Fowl pox, Coccidiosis, Gumboro, Marek's, Swine fever and Porcine Reproductive and Respiratory Syndromes (PRRS)	2
20.	Prevention and control of parasites of livestock and poultry (Ticks, Lice, Fleas, Liver fluke, Ascariasis and Tape worm)	2
	Total	**30**

Practical

S.N.	Topic	No. of practical
1.	Identification of external body parts of cattle, buffalo, sheep, goat, pig, poultry and rabbit	2
2.	Study of livestock housing system	1
3.	Study of body temperature, respiration rate and pulse rate	1
4.	Cleaning and disinfection of the animal barn	1
5.	Ageing of farm animals(Cattle , Buffalo, Sheep, Goat and Swine)	1
6.	Estimation of body weight by body measurement	2
7.	Identification of different farm animal and poultry breeds	2
8.	Numbering of farm animals and birds	2
9.	Study of different types of farm records	1
10.	Handling and casting of farm animals	1
11	Identification of feed ingredients and fodders	1
Total		**15**

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Course Code : **PLB 111**
Course Title : **Principles of Genetics**
Credit Hour : **3 (2+1)** **Full Mark: 75** **Theory: 50** **Practical: 25**

OBJECTIVE

This course is designed to help students to understand the science of inheritance through classical and molecular aspects of function of genes and principles of genetics.

SYLLABUS

Classical and molecular perspectives of genes, genetics and function of genes, cell division, life cycle of some organisms, linkage of genes, Mendelian inheritance pattern, probability for Mendelian genetics, gene interactions, transmission of quantitatively inherited genes, inheritance of cytoplasm genes, control and transmission of sex in plants and animals, structure and function of genes, modification of forms of genes, nature of jumping genes and gene regulation.

COURSE OUTLINE

Theory

S.N.	Topic	No. of lecture
1	Introduction, scope and history of genetics	1
2	Cell cycle and cell division (mitosis)	1
3	Cell division (meiosis)	1
4	Life cycles (virus and maize)	1
5	Life cycles (bacteria and man)	1
6	Mendel's laws of segregation, and simple problems	1
7	Mendel's laws of independent assortment, and complex problems	1
8	Probability and its calculations	1
9	Application of probability in Mendelian genetics	1
10	Statistical hypothesis testing to conclude phenotypic ratios	1
11	Gene interaction, a variety of dominance phenomena	1
12	Enzymatic explanation for phenotypic ratios	1
13	Sex determination in plants and animals	1
14	Sex linkage	1
15	Linkage and crossing over: Two point and Three point problems of mapping	1
16	Linkage and crossing over: complex problems of mapping, and LOD Score	1
17	Maternal effect	1
18	Inheritance of cytoplasmic genes	1
19	Quantitative genetics: Multiple factor hypothesis and Transgressive segregation	1
20	Inheritance of polygenic traits, discontinuous traits controlled by polygenes	1
21	Structure of nucleic acids (DNA and RNA)	1
22	DNA replication	1
23	Function of genes: Transcription and genetic code	1
24	Function of genes: Protein synthesis through transcription	1
25	Mutation	1
26	Chromosomal aberration: Structural changes	1
27	Chromosomal aberration: Numerical changes	1
28	Transposable genetic elements	1
29	Gene regulation: Lac operon	1
30	Gene regulation: Tryp operon	1
	Total	**30**

Practical

S.N.	Topic	No. of practical
1	Study of diagrams of meiosis	1
2	Study of diagrams of mitosis	1
3	Study of meiotic metaphase	1
4	Solve problems of segregation	1
5	Solve problems of independent assortment	1
6	Solve problems of hypothesis testing to conclude phenotypic ratios	1
7	Illustrations and problems of gene interaction	1
8	Solve problems of linkage (two-point cross)	1
9	Solve problems of LOD score	1
10	Problems of linkage (three point cross)	1
11	problems of probability	1
12	Problems of sex linkage	1

13	Construction of three dimensional picture of DNA using gypsum (plaster of Paris)	1
14	Examples of cytoplasmic and nuclear hereditary materials: genetics of male-sterility	1
15	Genetics of grain yielding traits of rice, wheat and maize	1
	Total	**15**

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Gardner, E.J., M.J. Simmons and D.P. Smutad, 2011. Principles of Genetics (8th Ed.). John Wiley and Sons Pvt. Ltd. Singapore.

Griffiths, A.J.F., S. R. Wessler, S.B. Carroll and J. Doebley, 2012. An Introduction to Genetic analysis (10th Ed.) W.H. Freeman and Company. New York. USA.

Singh, B.D. 2007. Fundamentals of Genetics (3rd Ed.). Kalyani Publishers. India.

Strickberger, M.W. 2012. Genetics (3rd Ed.) PHI Learning Pvt. Ltd. New Delhi, India.

Course Code : **EXT 111**
Course Title : **Fundamentals of Rural Sociology and Educational Psychology**
Credit Hour : **3 (2+1)** **Full Mark: 75** **Theory: 50** **Practical: 25**

OBJECTIVES

To impart knowledge to the students on sociological and psychological aspects of rural people and to acquaint with some important features of rural society and application in the field of agriculture.

SYLLABUS

Rural Sociology-meaning, nature, scope and relationship, importance, social values and attitudes, Nepalese rural society, rural urban continuum, social groups, social process, social movement, social stratification, inequality and culture concepts. Rural-social institutions, social problems and their solution, socialization, social change, social system, social deviance, and social control. Leadership, Educational psychology- Meaning, Concept; Education, learning: Learning theories, Basic Psychological concepts; motivation, Emotions Attitudes and Social Perception.

COURSE OUTLINE

Theory

S.N.	Topic	No. of lecture
1	Rural sociology: meaning, nature, scope, importance in Nepalese context and relationship with agricultural extension and other social sciences	1
2	Social values and attitude: meaning, definition, types and role of social values and attitudes in agricultural extension	1
3	Nepalese rural society: characteristics; cultural concepts, culture, customs, folkways, mores, taboos, rituals and traditions: meaning, definition and their role in agricultural extension.	1
4	Rural – urban continuum: concept, differences and relationship between rural and urban societies	1
5	Social groups: meaning and definition, and classification of groups	1
6	Factors considered in formation and organization of groups, stages of group formation, role of social groups in agricultural extension	1
7	Social process (process of social interaction): basic concepts; accommodation, adjustment, amalgamation, assimilation, cooperation, consensus, competition, conflict and integration	1

8	Conflict: stages, conflict intensity continuum and conflict management	1
9	Social movement: meaning and causes of social movement, early and recent theories and types of social movement	1
10	Social stratification: meaning, bases (class, caste, age and gender), viewpoints on stratification: functional, Marx and Max weber	1
11	Social stratification and inequality, caste/ethnic and regional exclusion in Nepal	1
12	Rural-social institutions: concept and functions:	
12.1	Social institutions: household, family and its types, and marriage system	1
12.2	Economic institutions: farming, fishing, hunting and exchange labor	1
12.3	Educational institution; political institutions: government; religious institutions: types of religion, their maintenance and followers	1
13	Social problems and solutions	1
14	Socialization: meaning, stages and agents of socialization	1
15	Overview of theories of socialization/self by Cooley, Mead and Freud	1
16	Social change; meaning and factors of social change	1
17	Agricultural technology and rural social change	1
18	Social system: meaning and elements of social system	1
19	Social deviance and social control; meaning, types and mechanisms	1
20	Leadership: meaning, classification, function and role of local farm leader in agricultural development and 21 qualities of good leader	1
21	Education, psychology, educational psychology, social psychology: definitions and importance in agricultural extension	1
22	Basic principles of human behavior: sensation, attention, perception: meaning and characteristics. Basic concept of change in the behavior: knowledge, skills & attitudes. Characteristics & differences between formal, non-formal & informal education	1
23	Concept of learning: three domains of learning. Types of learners: theorist, pragmatist, reflectors and activist. Learning cycles: conceptualization, construction and the dialogue	1
24	Learning theories: four learning theories and Thorndike's four laws of learning	1
25	Effective teaching learning elements. Factors affecting effective teaching learning situation	1
26	Basic psychological concepts; intelligence, personality, motivation, emotions, attitudes and social perception	1
27	Personality: traits, types and measurement. Factors influencing the personality. Motivation: significance, techniques; perception: determinants, errors; attitudes: factors influencing the development of attitudes	1
28	Roles of personality, motivation, attitudes and perceptions in agricultural extension	1
	Total	**30**

Practical

S.N.	**Topic**	**No. of practical**
1.	Visit to a village to study the characteristics of rural society	1
2.	Study of rural social institutions and organizations: school or cooperative or rural municipality/local government authorities. Working of basic rural institutions (group exercise)	2
3.	Visit to a village to conduct the selection of a leader (based on sociogram technique) (group exercise).	1

4.	Visit to a rural community to identify different social groups to which the farmers are associated	1
5.	Visit to a village to list out the taboos, folkways, rituals, and social values in the village	1
6.	Preparation of interview schedule to study the social characteristics of rural society: pattern of settlement, culture, social stratification, social values, social control, customs, social interaction process, social change and social problems (group exercise)	1
7.	Identification of important value systems in the rural setting as a means of social control	1
8.	Identification of rural personality traits that affect the development of personality in rural situation	1
9.	Conducting role play technique by the students to exhibit different leadership styles (group exercise)	2
10.	Creating a learning situation under village conditions. Visit to a village to organize an exhibition for farmers (group exercise)	2
11.	Practice on personality and intelligence measurement techniques (group exercise)	2
	Total	**15**

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